



ALPHA & OMEGA
SEMICONDUCTOR

AOTF10N50FD

500V, 10A N-Channel MOSFET with Fast Recovery Diode

General Description

The AOTF10N50FD has been fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low $R_{DS(on)}$, C_{iss} and C_{rss} along with guaranteed avalanche capability this part can be adopted quickly into new and existing offline power supply designs.

For Halogen Free add "L" suffix to part number:
AOTF10N50FDL

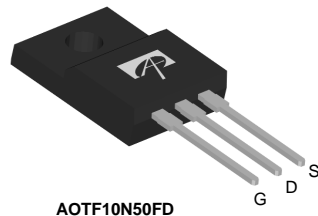
Product Summary

V_{DS}	600V@150°C
I_D (at $V_{GS}=10V$)	10A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 0.75Ω

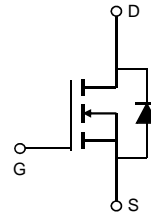
100% UIS Tested
100% R_g Tested



Top View
TO-220F



AOTF10N50FD



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	AOTF10N50FD	Units
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	10*
		$T_C=100^\circ\text{C}$	6*
Pulsed Drain Current ^C	I_{DM}	33	A
Avalanche Current ^C	I_{AR}	3.8	A
Repetitive avalanche energy ^C	E_{AR}	216	mJ
Single pulsed avalanche energy ^G	E_{AS}	433	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	50
		Derate above 25°C	0.4
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	T_L	300	°C

Thermal Characteristics

Parameter	Symbol	AOTF10N50FD	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	2.5	°C/W

* Drain current limited by maximum junction temperature.

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =10mA, V _{GS} =0V, T _J =25°C	500			V
		I _D =10mA, V _{GS} =0V, T _J =150°C		600		
BV _{DSS} /ΔT _J	Zero Gate Voltage Drain Current	I _D =10mA, V _{GS} =0V		0.56		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =500V, V _{GS} =0V			10	μA
		V _{DS} =400V, T _J =125°C			100	
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±30V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =5V, I _D =250μA	2.5	3.1	4.2	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =5A		0.6	0.75	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =5A		10		S
V _{SD}	Diode Forward Voltage	I _S =10A, V _{GS} =0V		0.93	1.6	V
I _S	Maximum Body-Diode Continuous Current				10	A
I _{SM}	Maximum Body-Diode Pulsed Current				33	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	820	1030	1240	pF
C _{oss}	Output Capacitance		75	112	150	pF
C _{rss}	Reverse Transfer Capacitance		5	10	15	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.7	3.4	5.2	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =400V, I _D =10A	20	26	35	nC
Q _{gs}	Gate Source Charge			4.8		nC
Q _{gd}	Gate Drain Charge			9.5		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =250V, I _D =10A, R _G =25Ω		24		ns
t _r	Turn-On Rise Time			65		ns
t _{D(off)}	Turn-Off DelayTime			69		ns
t _f	Turn-Off Fall Time			50		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =10A, dI/dt=100A/μs, V _{DS} =100V		116	190	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =10A, dI/dt=100A/μs, V _{DS} =100V		0.3	0.6	μC

A. The value of R_{θJA} is measured with the device in a still air environment with T_A=25° C.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C, Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150° C. The SOA curve provides a single pulse rating.

G. L=60mH, I_{AS}=3.8A, V_{DD}=150V, R_G=25Ω, Starting T_J=25° C

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

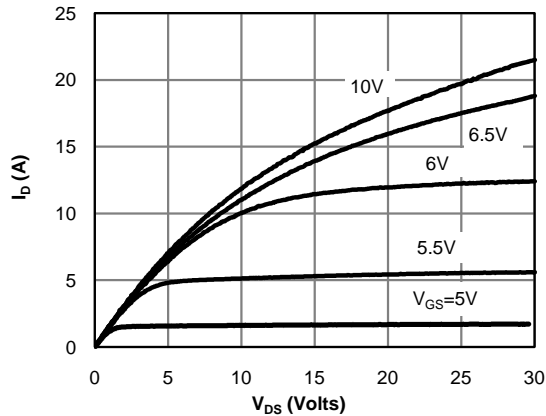


Fig 1: On-Region Characteristics

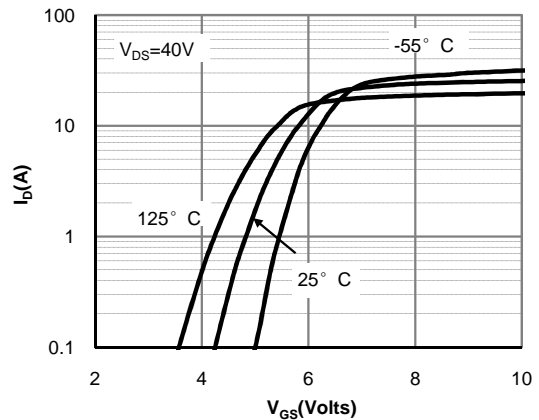


Figure 2: Transfer Characteristics

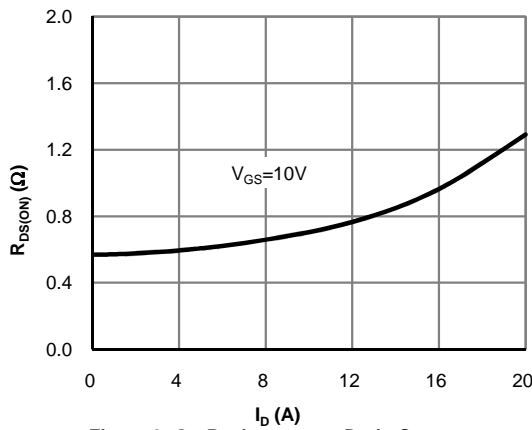


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

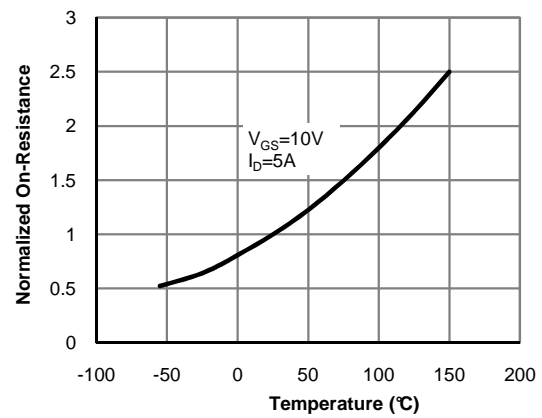


Figure 4: On-Resistance vs. Junction Temperature

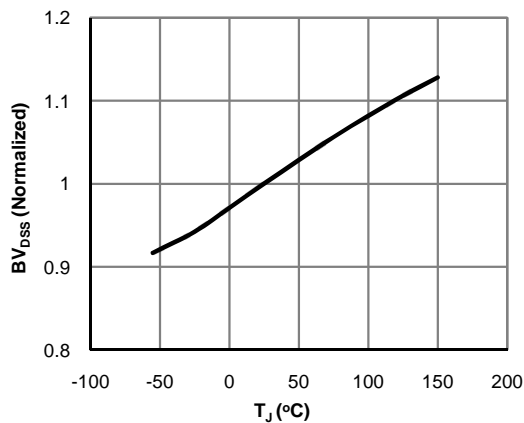


Figure 5: Break Down vs. Junction Temperature

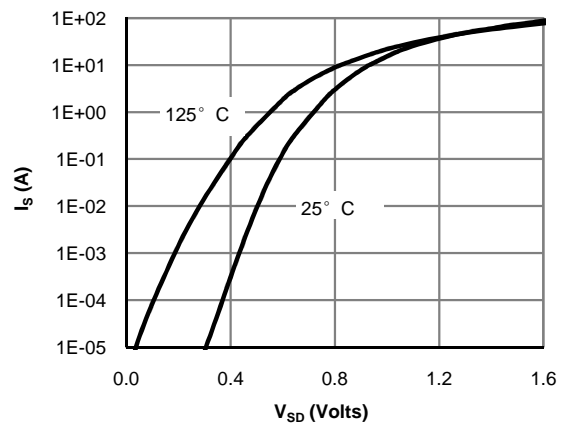


Figure 6: Body-Diode Characteristics (Note E)

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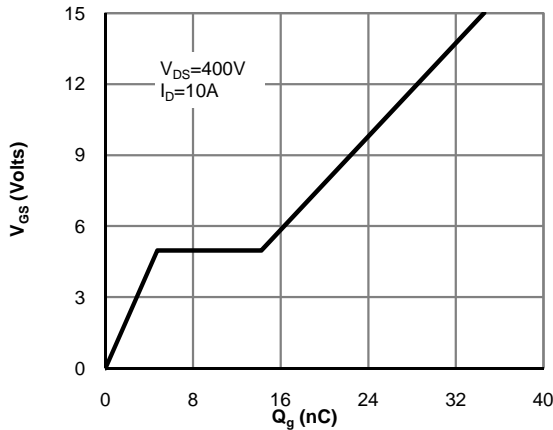


Figure 7: Gate-Charge Characteristics

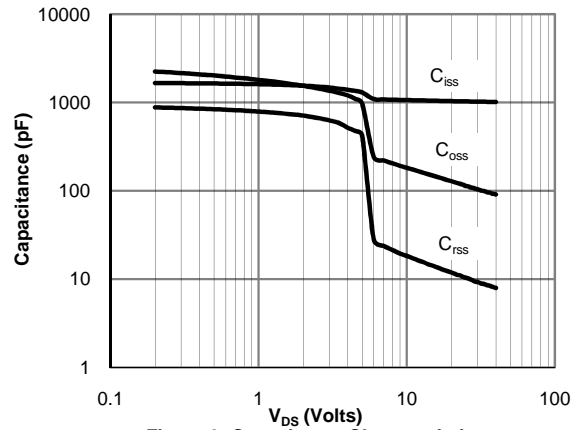


Figure 8: Capacitance Characteristics

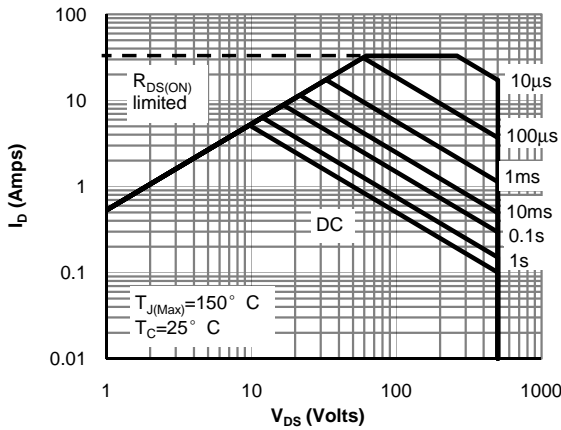


Figure 9: Maximum Forward Biased Safe Operating Area for AOTF10N50FD (Note F)

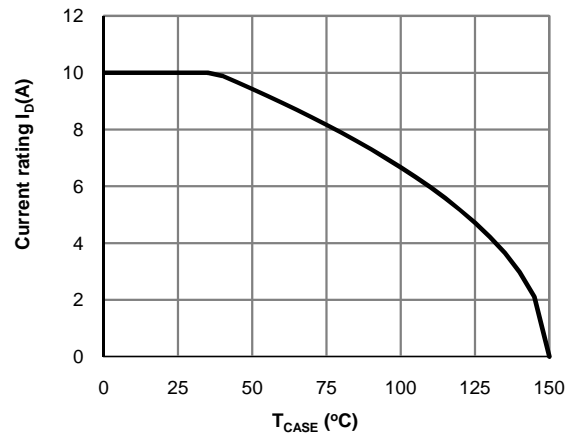


Figure 10: Current De-rating (Note B)

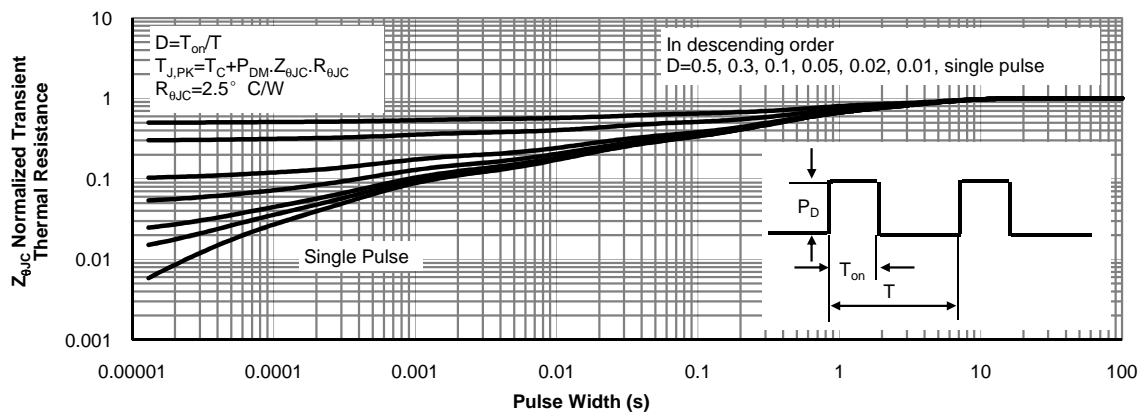


Figure 11: Normalized Maximum Transient Thermal Impedance for AOTF10N50FD (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

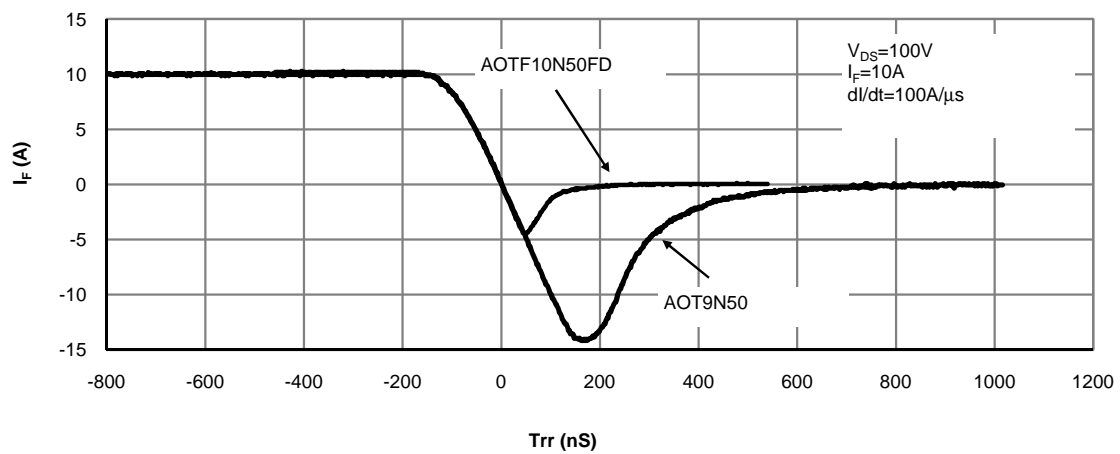
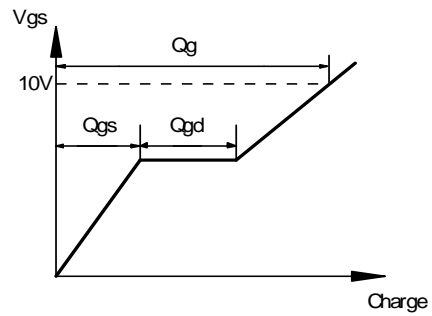
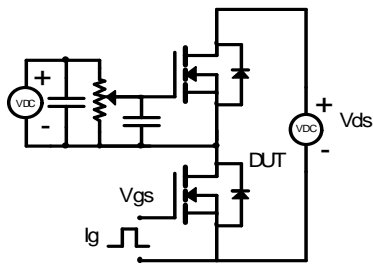
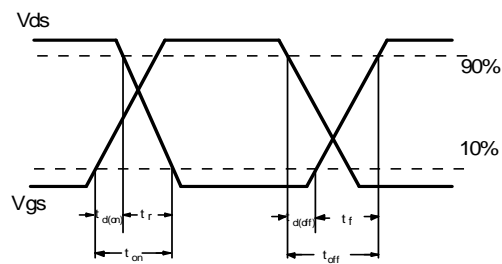
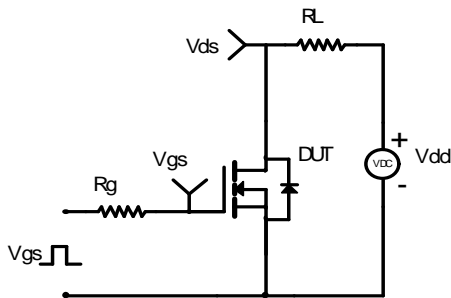


Figure 12: Diode Recovery Characteristics

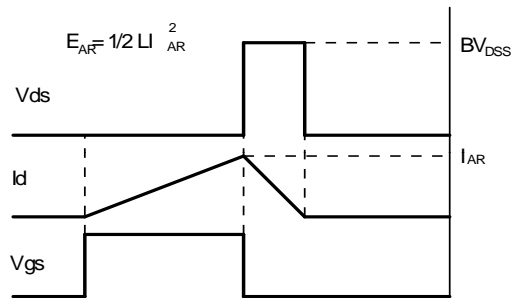
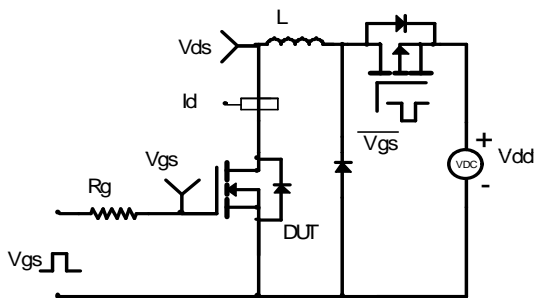
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

